

# ***US Embassy - Baghdad***

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## ***Workshop 3 - Electricity generation **and transmission** reform issues***

**Presented by Tetra Tech ES Inc.**

**13 September 2012**



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**UNCLASSIFIED**



# Outline



- Objective
- Options for organization and operation of generation sector:
  - Power sector reform framework
  - Structural reorganization,
  - Types of power sector models
  - Generation technologies
- The role of IPP's in reformed sector
  - Public-Private Partnerships (PPP)
  - Private Sector Participation through Independent Power Producers (IPP) - Project structure, types, key agreements, **risk allocation, documents to prepare tender for IPPs,**
- The impacts of payment, non-payment and subsidies



# Outline



- Options for organization and operation of transmission sector
  - Transco
  - Independent system operator
  - Corporatization & commercialization
  - Transmission technical issues
- Single buyer (definition, types, functions, pros and cons)
- Transmission cost recovery
- The necessity for clear defined choices- Why reform – Country goals
- Discussion



# Objective



Assist the Government of Iraq in the formulation of an electricity sector reform plan by:

- Participating in a series of training events intended to support the Government of Iraq's design of an electricity sector reform program
- Providing guidance on the key elements to consider in designing and implementing generation and transmission sector reforms in developing countries



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# *Energy Sector Reform - Definition*



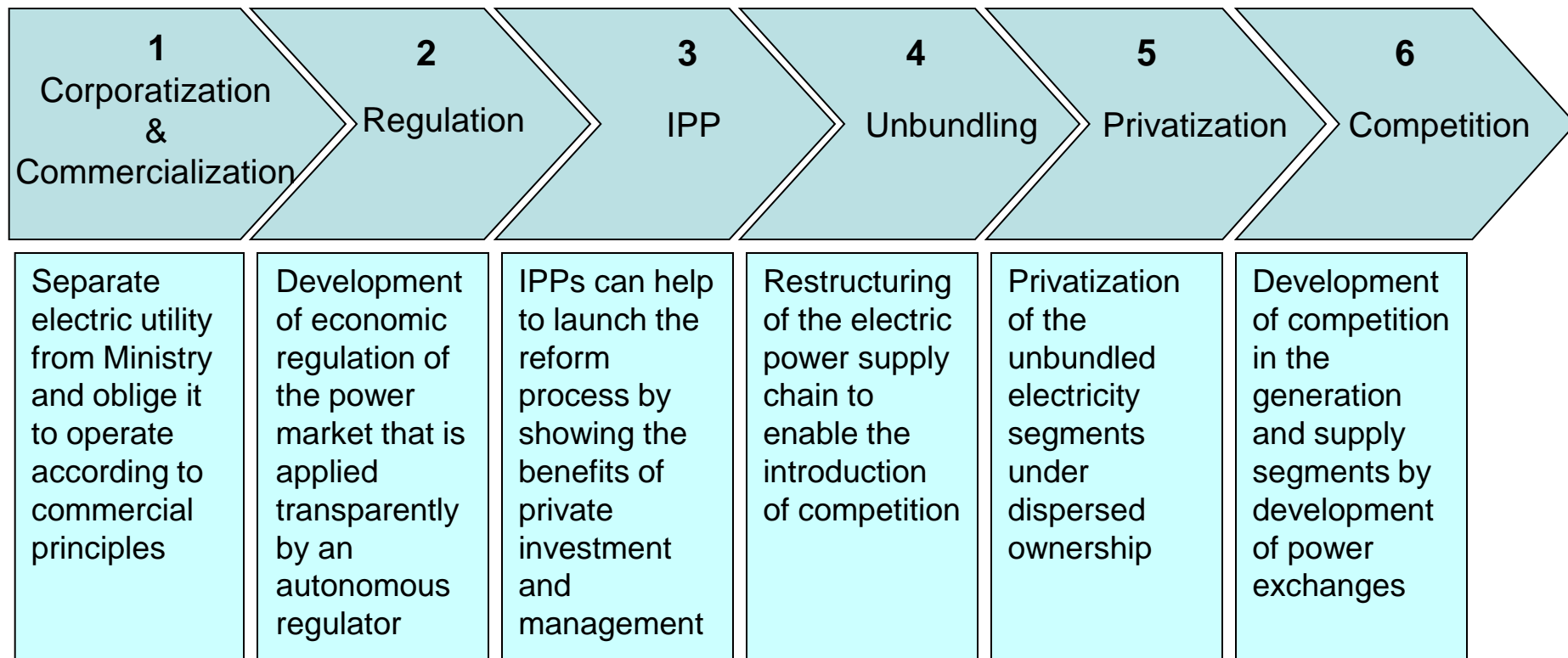
Energy Sector Reform generally refers to a set of programs at the national level, designed to achieve a set of objectives

- There are various different objectives, depending on the macroeconomic situation, existing conditions, and view of the government
- There are various different programs, depending on the objectives
- Each country is unique, with different strengths and weaknesses, and so the set of reforms needed are different
- Energy sector reform implemented progress in countries all over the world (LAC, US, UK, EU, Eastern Europe, former Soviet Union, developing countries)



# ***“Classical” model of reform***

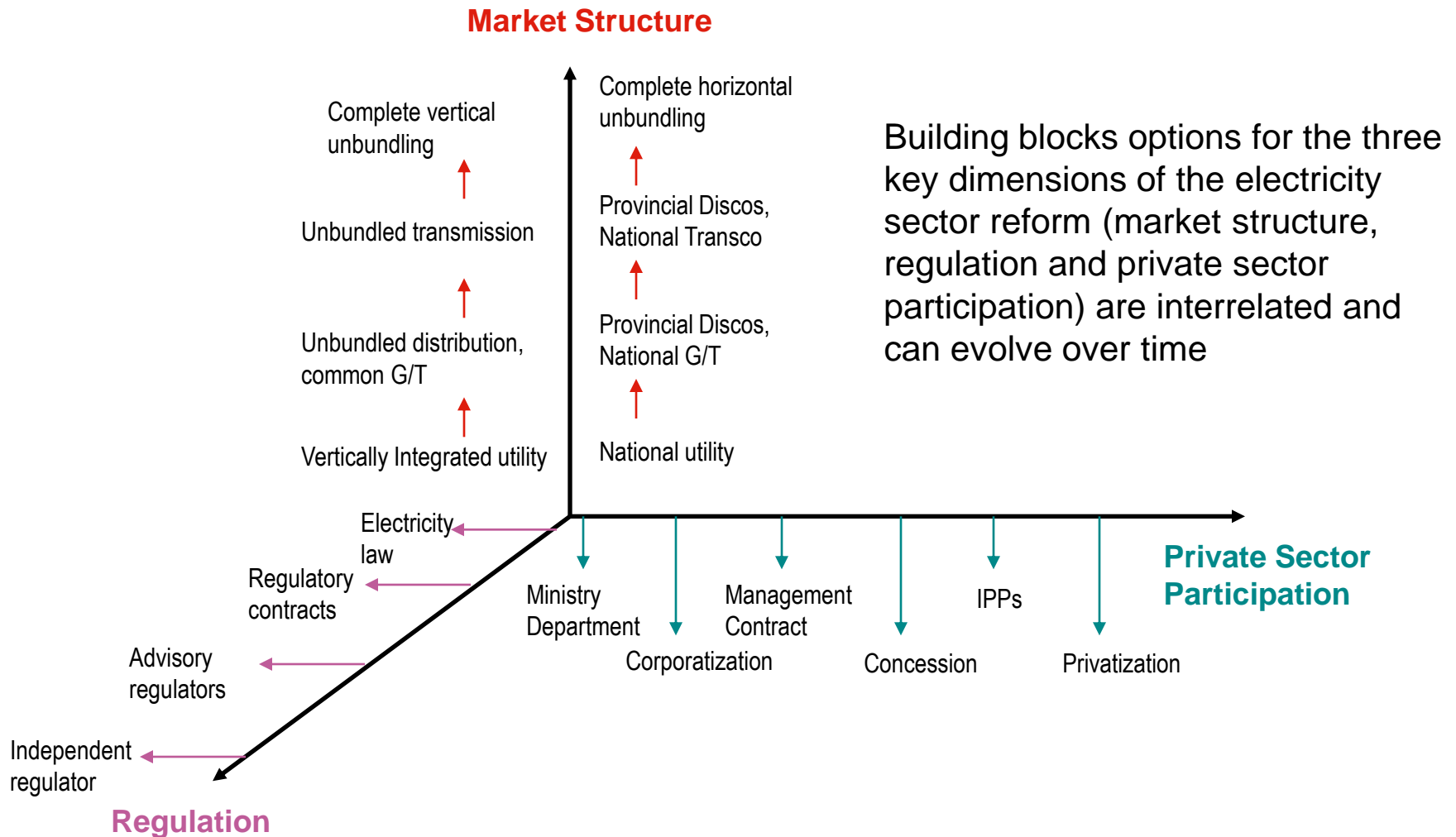
The processes of reform that started in Chile and the UK in the 1980s, gradually crystallized into a standard “textbook” model for electricity sector reforms, comprised by six steps:



Source: Besant-Jones (2006), Gratwick and Eberhard (2002)

# Key dimensions of reform

Power sector reform is an evolving menu of options







# Structural reorganization - generation

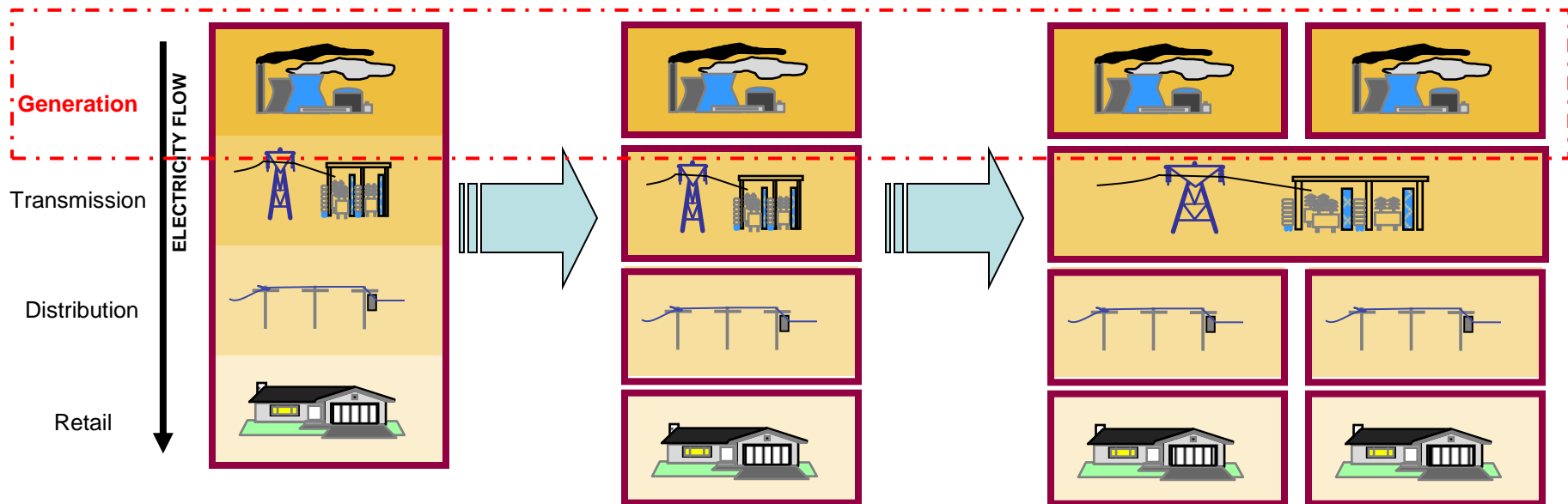


Reorganization can be introduced by unbundling vertically and horizontally

Vertically  
Integrated

Vertical unbundling isolates  
sectors of the industry where  
competitiveness is possible

Horizontal unbundling to  
increase the number of  
players in the sector

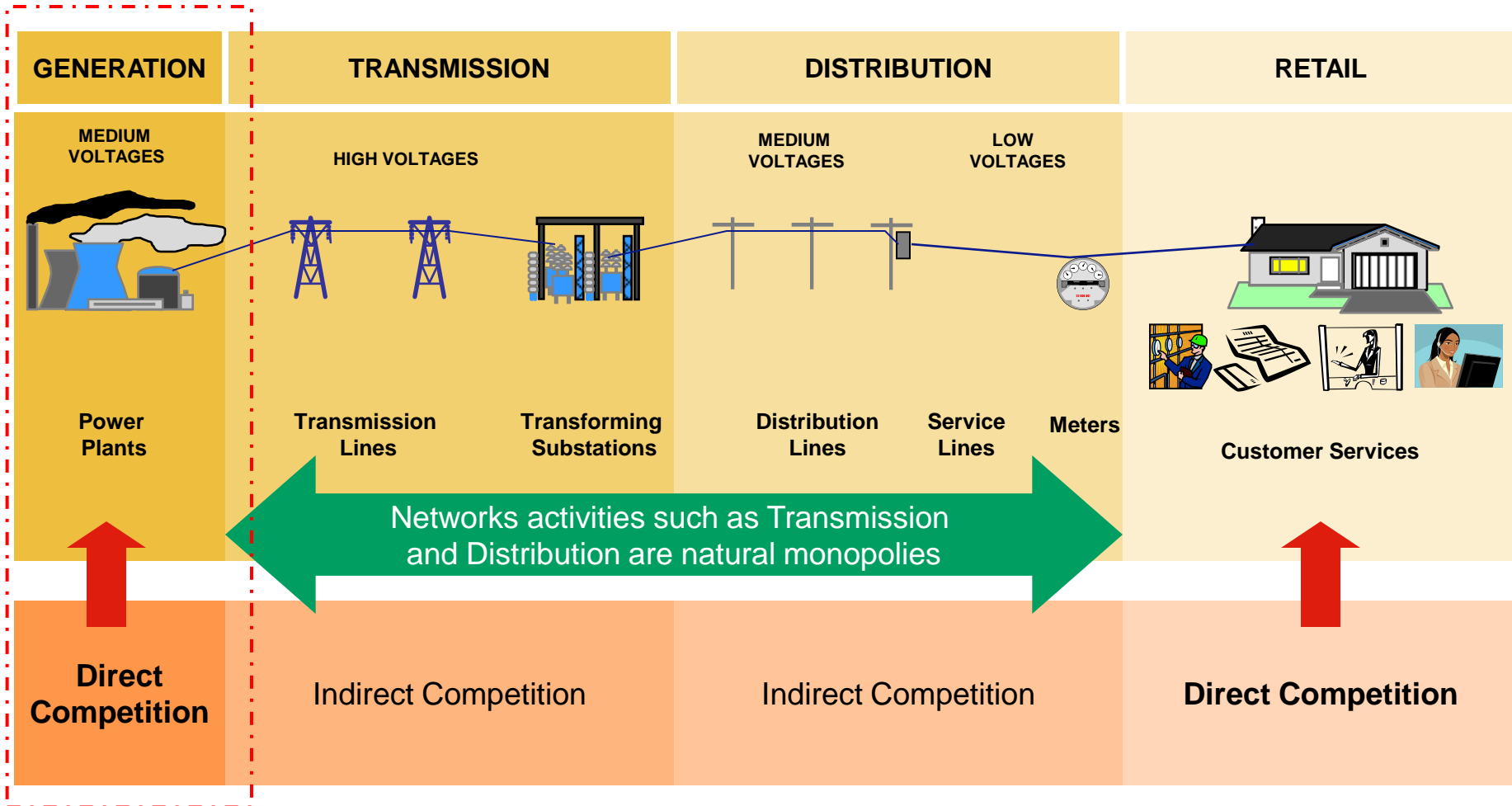




# Structural reorganization - generation

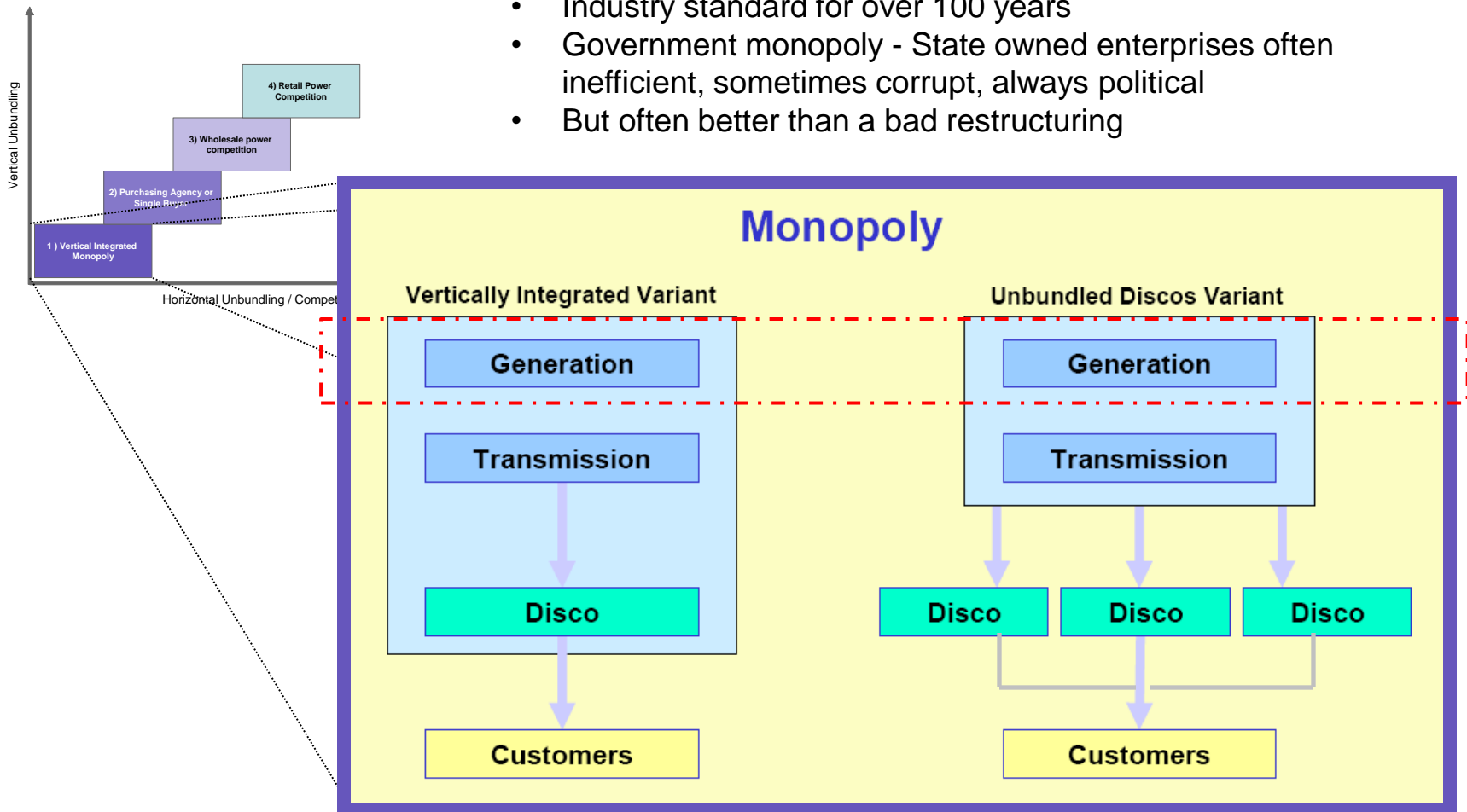


The nature of the power industry defines the type of competition in each of the functional area :



# Power sector models -focus on generation

## Vertically Integrated Monopoly, with no direct competition...

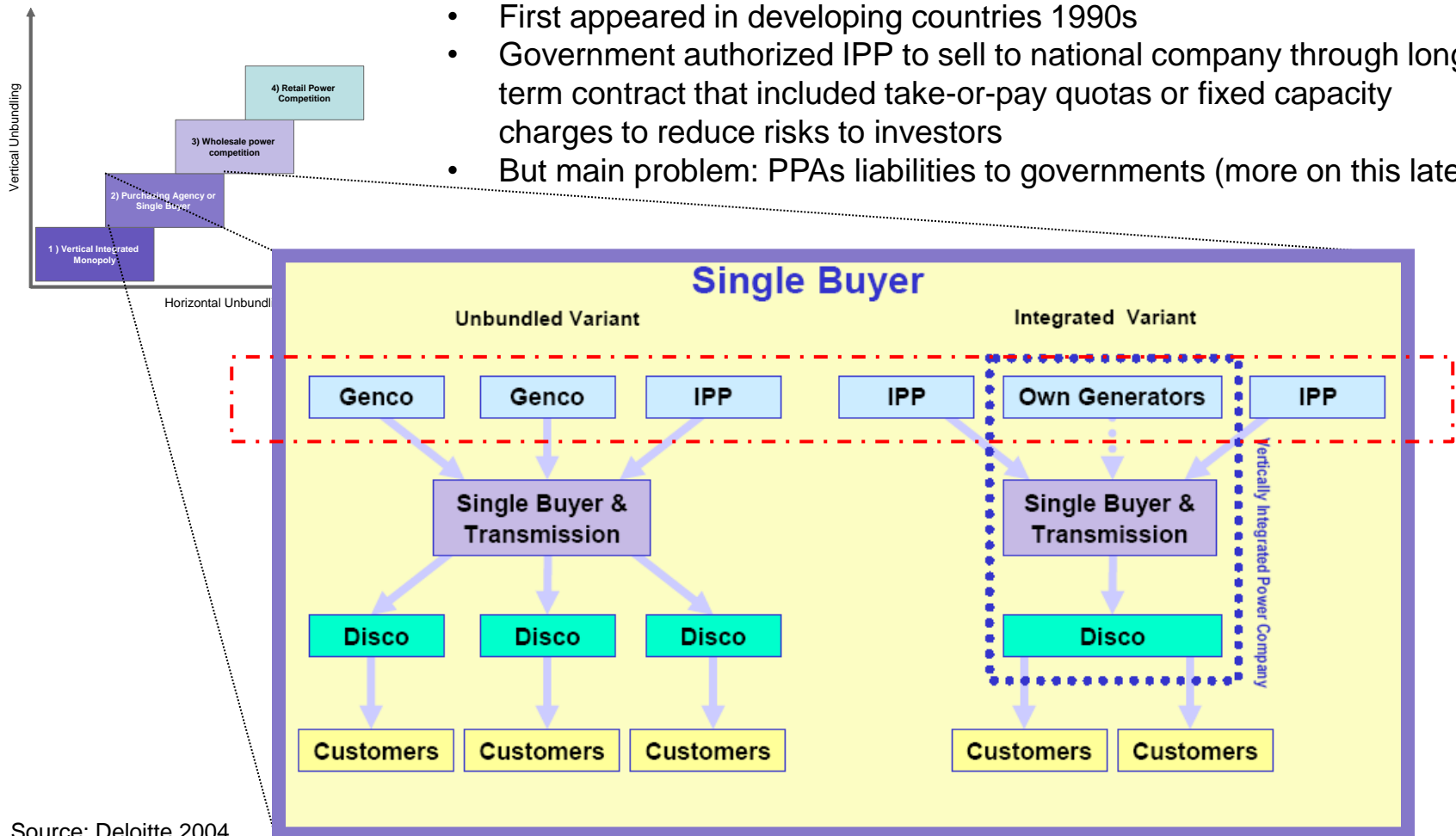


Source: Deloitte 2004

# Power sector models -focus on generation

Single Buyer, in which an agent centralizes the purchase of electricity for from generation companies

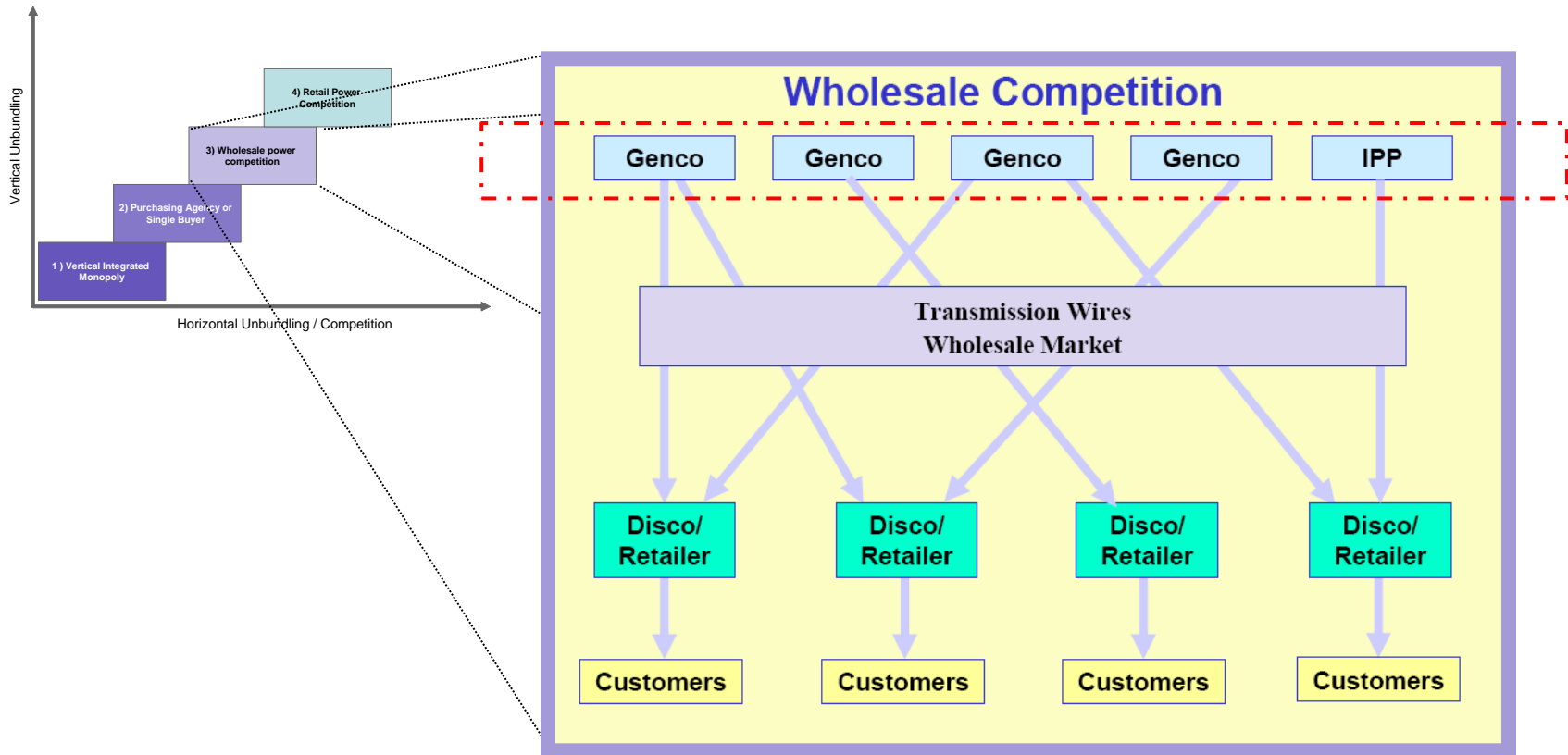
- First appeared in developing countries 1990s
- Government authorized IPP to sell to national company through long-term contract that included take-or-pay quotas or fixed capacity charges to reduce risks to investors
- But main problem: PPAs liabilities to governments (more on this later)



Source: Deloitte 2004

# Power sector models -focus on generation

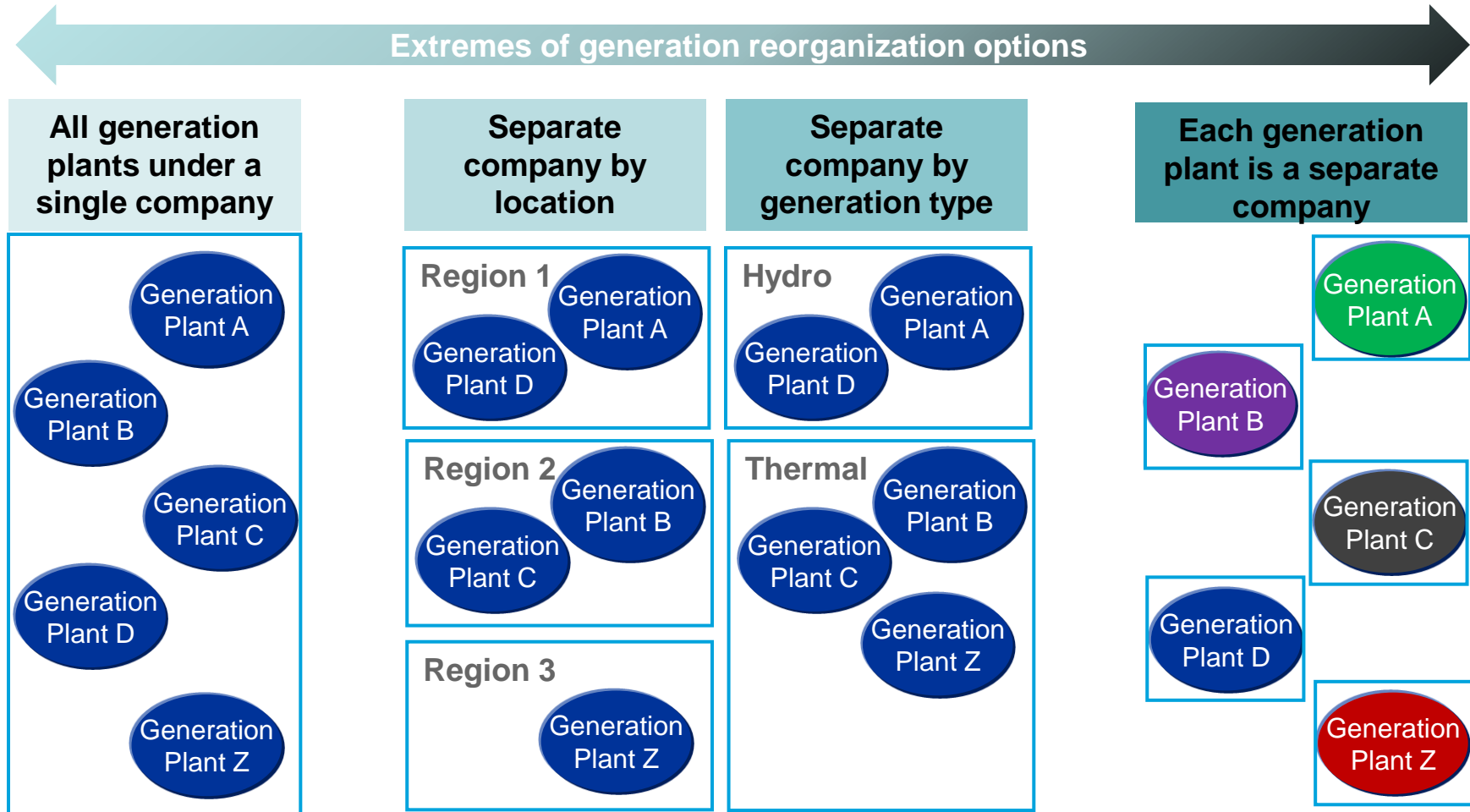
Wholesale Competition, where generators compete to sell electricity under an organized wholesale power exchange or under bilateral arrangements



Source: Deloitte 2004

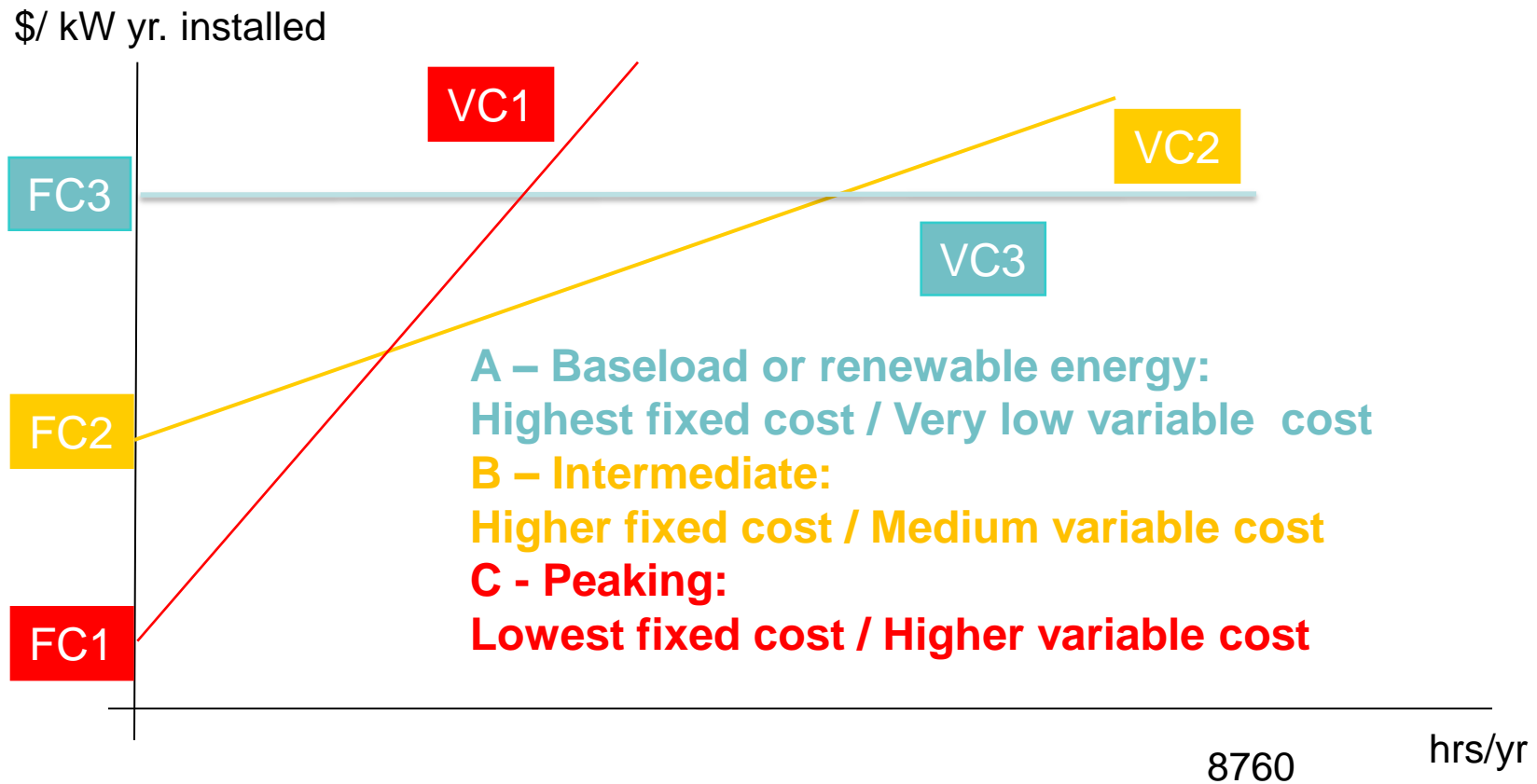
# Reorganization of generation

Range of generation sector reorganization options can include:



Decisions must be taken based on trade-offs

## Generation technologies relative generation cost:

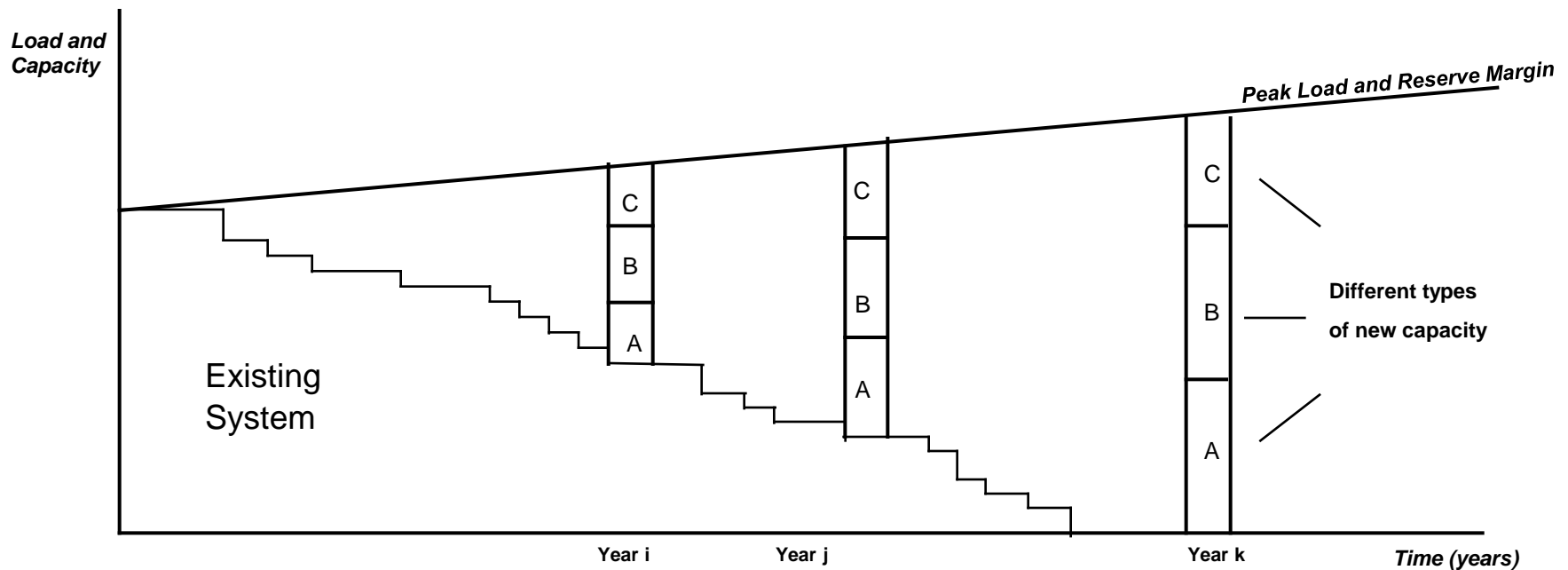




# Generation technologies planning



Different types of generation technologies are used in least cost expansion plan



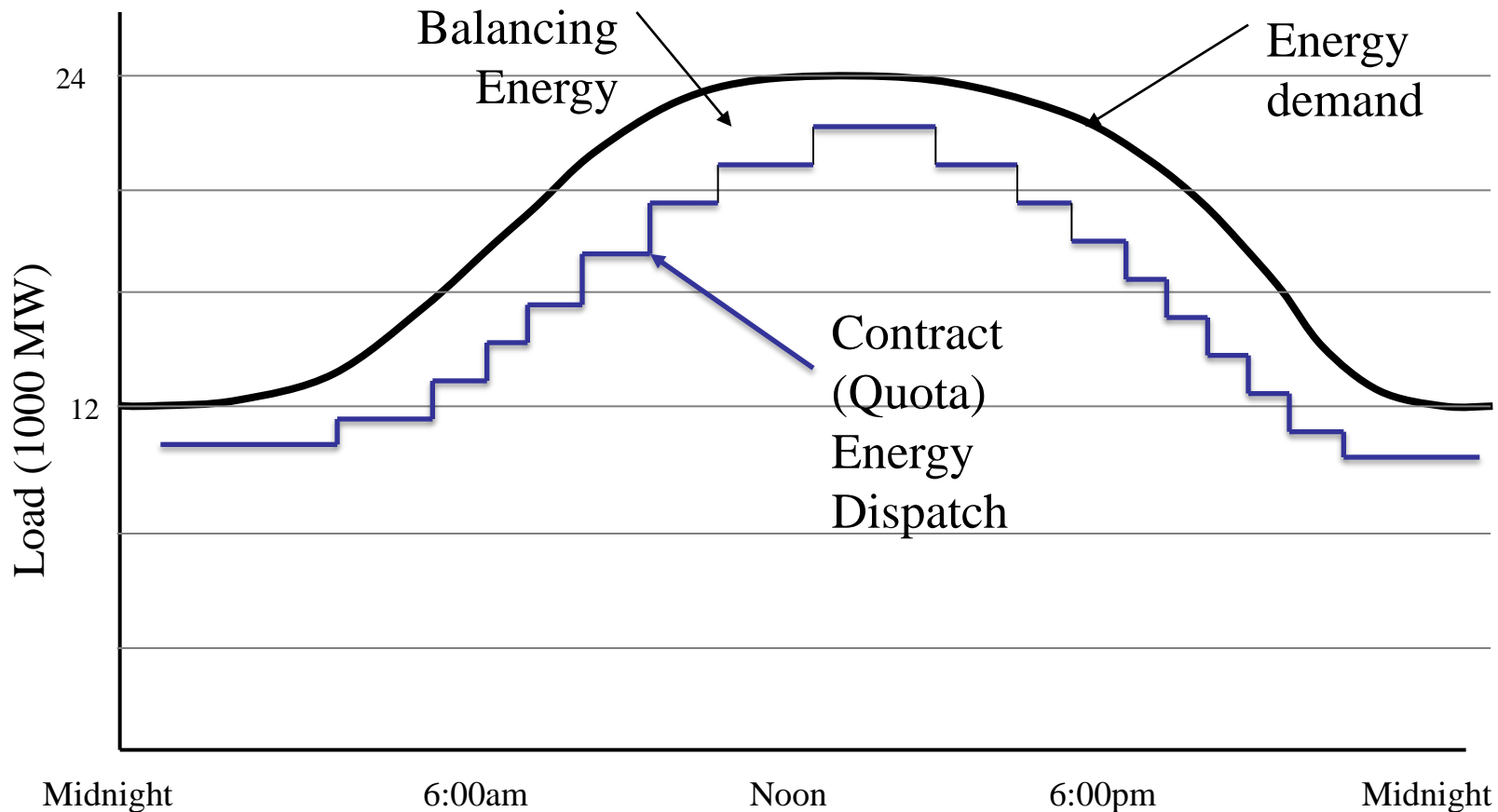




# Generation technologies uses



In a competitive wholesale market, generation dispatch includes contract (quota) + additional energy to balance





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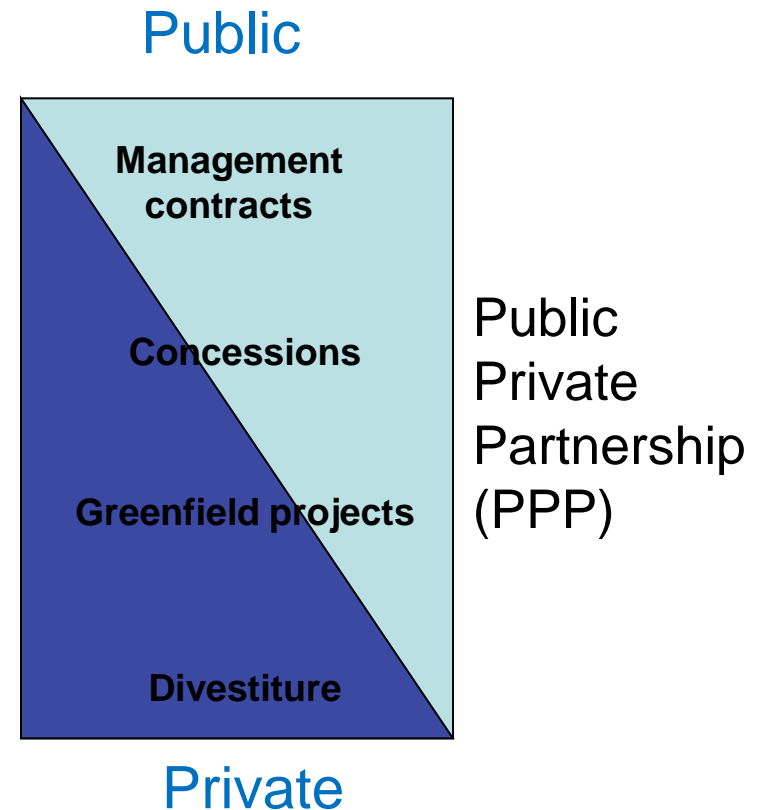


# Private sector participation



Private Sector Participation (PSP) is vital for sustainable electricity sector reforms tailored to country conditions....

- It is evident that improved policies to create a favorable private investment framework must be in place
- These policies can vary from country to country, from least to most favorable and can evolve through time
- These policies need to create a framework to attract private sector investment





# Private sector participation



## Private sector participation main options and characteristics:

Option	Asset Ownership	Operation & maintenance responsibility	Capital investment	Commercial Risk	Typical duration	Primary application	Main type of facility	
Service contract	Public	Public & <b>private</b>	Public	Public	1-2 yrs.	Operations	Any	Mgmt contracts
Management contract	Public	<b>Private</b>	Public	Public	3-5 yrs.	Operations	Any	
Affermage	Public	<b>Private</b>	Public	Shared	5-15 yrs.	Operations	Network	
Lease	Public	<b>Private</b>	Public	Shared	5-15 yrs.	Operations	Network	
Design-build operate	Public	<b>Private</b>	Public	Shared	1-10 yrs.	New construction	Generation, transmission	
Concession	Public	<b>Private</b>	<b>Private</b>	<b>Private</b>	20-30 yrs.	Operations & new construction	Network	Concessions
Build- operate-transfer (BOT)	<b>Private</b>	<b>Private</b>	<b>Private</b>	<b>Private</b>	20-30 yrs.	New construction	Generation, transmission	Greenfield
Divestiture	<b>Private</b>	<b>Private</b>	<b>Private</b>	<b>Private</b>	Indefinite	All	Any	Divestiture

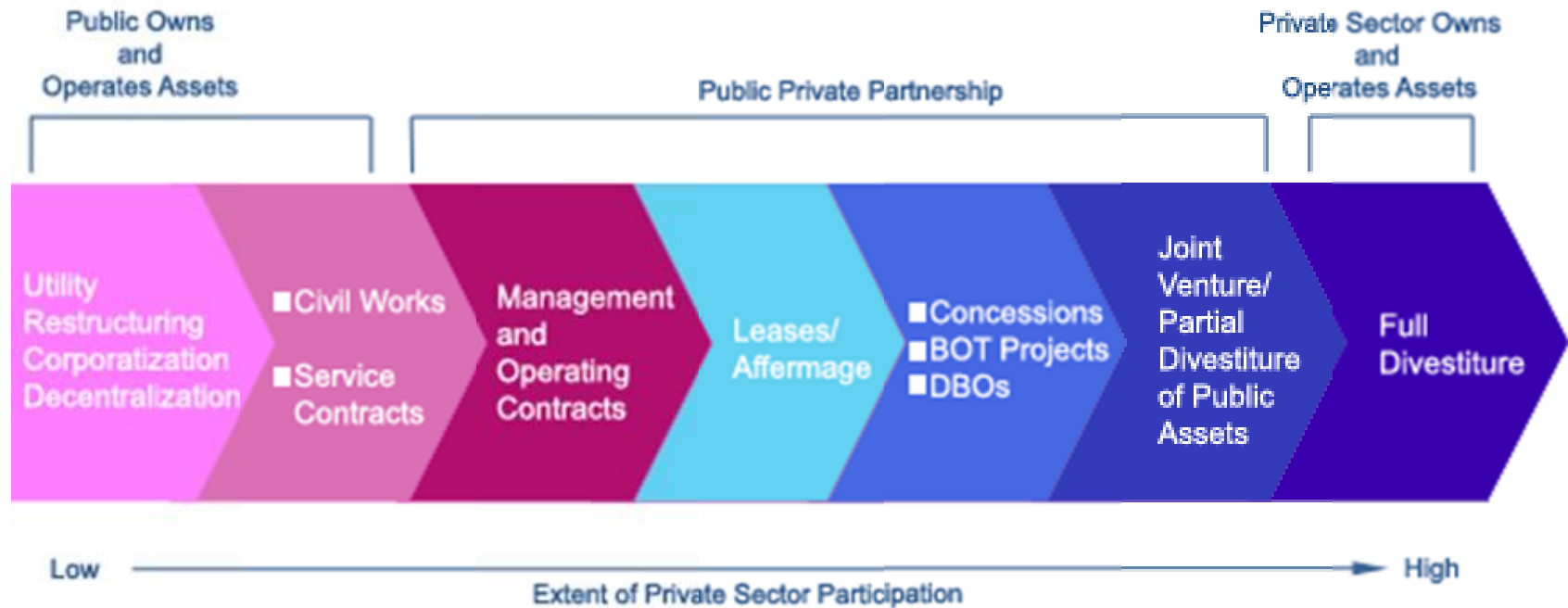
Adapted from: Ljung (2007)



# Private sector participation



## Private sector participation main options



Source: World Bank's PPP Resource Center



# *Public Private Partnership – PPP - Concept*



PPP concept: Public and private sectors work in co-operation and partnership to provide infrastructure and services

- Public sector contracts with the private sector to deliver services on its behalf
- A special purpose firm is created to deliver these services. The private sector firm is responsible for building, operating, maintaining and financing the asset and providing the service for the long term (20-30 years) in exchange for regular payments from the public sector
- At the end of the contractual period the operation of the asset reverts to the public sector



# *Private sector participation in generation - IPPs*



Build-Own-Operate-Transfer (BOOT) contracts:

- Government entity enters into a long-term, off-take contract to buy power from the private party who builds and operates the plant for a specific number of years.
- At the end of the contract period, ownership of the assets is transferred to the government.
- Project financing is set up through agreements defining the rights and obligations of all parties: the utility off-taker, fuel suppliers, investors, lenders, operators, engineering construction firms, etc.



# *Private sector participation in generation - IPPs*



Variations of BOT contracts:

- Build-Operate-Own (BOO) - Assets are not transferred to the government
- Build-Operate-Transfer (BOT)
- Build-Lease-Transfer (BLT)
- Build-rehabilitate-operate-transfer (BROT)
- Rehabilitate-operate-lease (ROL)
- Rehabilitate-operate-maintain (ROM)
- Others

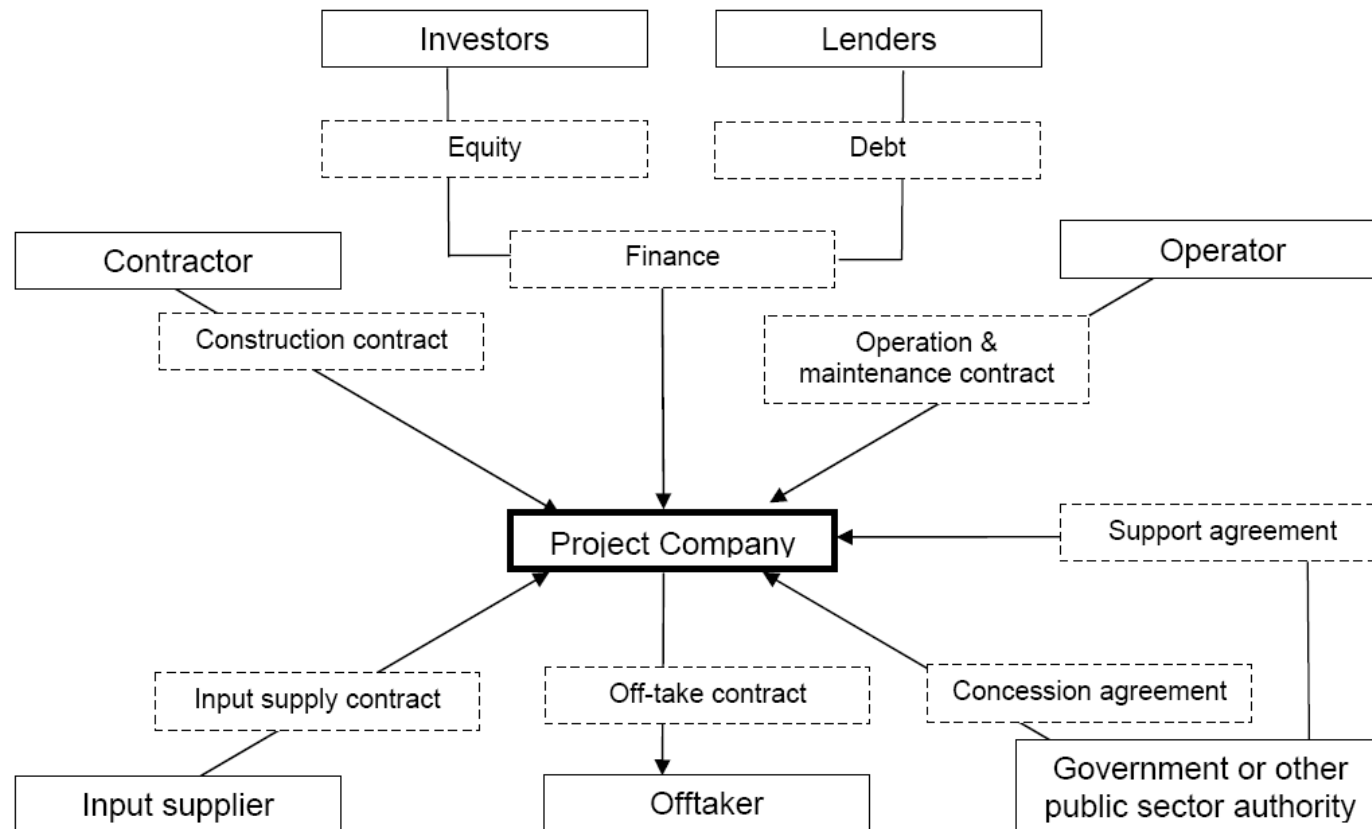




# Private sector participation in generation - IPPs



Typical independent power producer (IPP) project structure:





# IPP - Instruments



## Key IPP agreements include:

Implementation Agreement	Seeks to guarantee performance of government entities involved in project including terms and conditions to ensure implementation of other key power agreements
Power Purchase Agreement	Establishes power sales obligations (producer-purchaser) including specific technical conditions over a period of time and defines compensation arrangements
Fuel Purchase Agreement	Long-term fuel supply and transportation agreement ensuring firm and reliable supply
Land Agreement	Long-term lease or land purchase agreement for physical area required by the project including plant, switchyard, etc.
Operations & Maintenance Agreement	Agreement with contractor for carrying-out O& M activities to run and maintain the facility and should be consistent with obligations established in PPA including standards for plant availability, heat rate, efficiency, etc.
Internal IPP Agreements	Engineering Procurement Construction (EPC) contract, financing agreements (loans)



# *Private sector participation in generation - IPPs*



## IPP's experience:

- IPPs are viewed as a way to attract capital into a sector quickly in order to:
  - Meet a growing demand-supply gap
  - Preserve government owned power companies
- Developing countries learned on the job:
  - During procurement
  - Financing
  - Operations and management
- IPPs are able to succeed even when a fully developed regulatory structure is not available; as regulations can be embedded in the contractual documents



# *Private sector participation in generation - IPPs*



Broadly main problem areas with IPP contracts are:

- Fixed prices are required to attract investors (such as “take or pay” terms)
- Fixed prices create a stable and certain revenue stream for the IPP
- Relatively long duration
- Lack of requirement for the IPP to assume any market risk
- Contract provisions that are less demanding than detailed market rules which are designed to promote increased efficiency and competition.



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# *Subsidies*



Higher or lower subsidies? - Tradeoffs require difficult choices:

- Political pressure - low tariffs, implies subsidies
- National development - needs marginal cost-based tariffs for investment, means either higher tariffs or subsidies
- Efficiency - implies full cost recovery tariffs, higher for residential
- Budget – impact of subsidies on current account

It is impossible to satisfy all these objectives - some are conflicting with others. So, Government must set its priorities.



# Subsidies



For many countries low electric prices are a political imperative

- But prices set below cost of production results eventually in a bankrupt, non-performing sector
- Governments see that they are spending too much on electric investment with poor quality results and therefore private capital seems a good solution
- But to attract private capital, the tariffs must support a reasonable return
  - This may mean higher prices, not lower prices, from restructuring
- If the tariffs could support a reasonable return in the first place, you might not need private capital at all



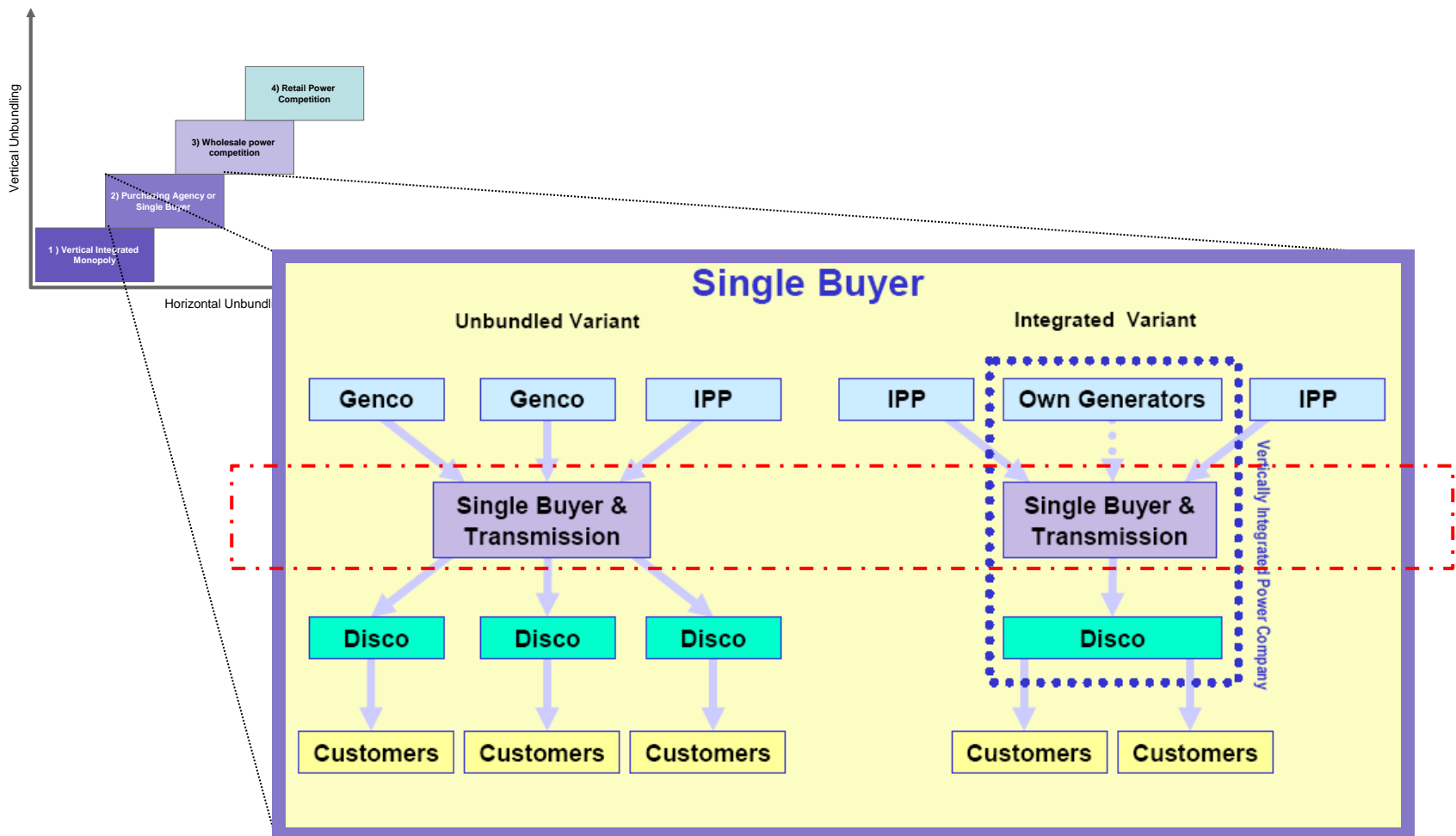
# Outline



- Single buyer (definition, types, functions, pros and cons)
- The necessity for clear defined choices- Why reform – Country goals
- Discussion



Single Buyer, in which an agent centralizes the purchase of electricity for the distribution companies



Source: Deloitte 2004



# Single Buyer Model



Single buyer model continues to be a valid wholesale energy trading arrangement. It has been adopted in several countries for many reasons:

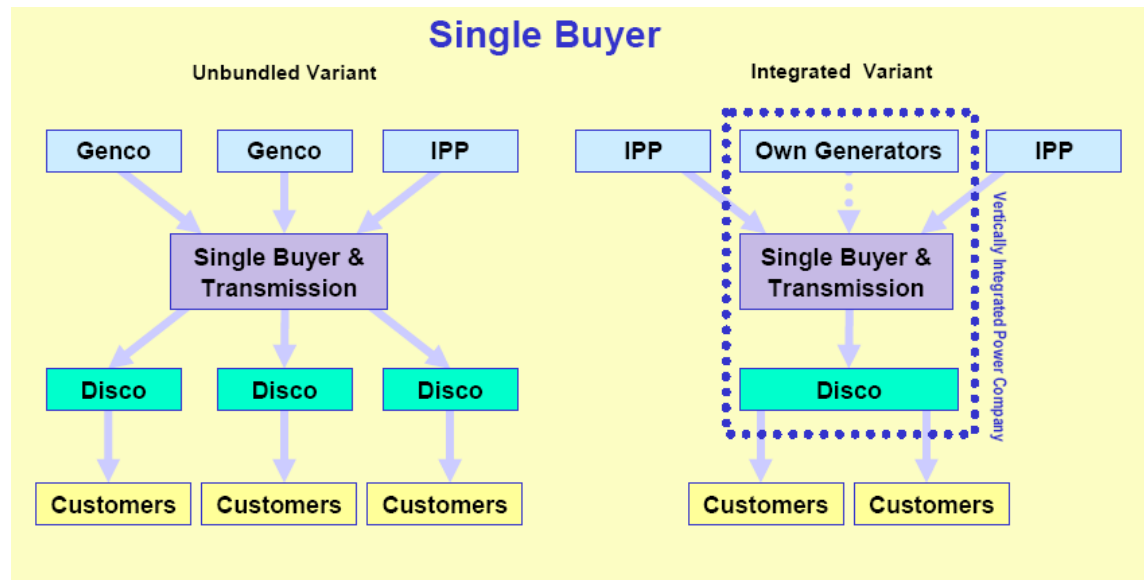
- It is a relatively simple model
- It allows a single point of access for subsidies
- Having a single buyer enables standard tender procedures, which simplifies procurement
- It has been used as a first step in countries with poorly performing power sectors, or bankrupt government owned utilities
- Countries prefer single buyer model to maintain government's control of power sector development (subsidies, rationing of scarce supply)

## Single buyer model main characteristics:

### Central entity that:

- Aggregates demand
- Procures energy from Gencos
- Allocates energy among Discos
- Collect payments from Discos
- Pays Gencos

Pure Single buyer model could be organized in two ways: Vertically integrated and functionally unbundled



Source: Deloitte 2004



# *Vertically integrated single buyer*



Main characteristics of vertically integrated single buyer:

- Historical vertically integrated utility (VIU) buys all energy at wholesale market
- VIU owns generation plant but not sufficient to cover 100% of demand, and so buys from IPPs
- Electricity trading typically carried-out via long-term PPAs between VIU and IPPs
- Used in many countries at early stages of reform



# *Unbundled single buyer*



Main characteristics of unbundled single buyer:

- Single buyer is not a VIU, not associated with generation business
- In simple case, single buyer combines transmission assets, power system operations functions and wholesale trading activities
- Since single buyer does not own generation it is perceived as providing non-discriminatory access to grid (not favoring one generator over another)
- Used in many countries at early stages of reform



# Single buyer – pros and cons



## Main characteristics of single buyer:

### ADVANTAGES

- Ability to attract capital in generation by offering long-term PPAs
- Workable alternative for a distressed power sector to initiate reform
- Ability to centralize purchases, developing expertise and benefiting from economies of scale
- Ease of implementation, in terms of not requiring fundamental changes in sector structure, deal making and acceptability by the prevailing culture
- Preserve key investment decisions in the government hands (e.g. transmission, hydro-based generation)

### DISADVANTAGES

- Some Single Buyers have failed to develop a good track record of sound procurement practices
- Lack of transparency as a pathway to corruption (excessive centralization of key decision in environments with poor governance: centralized expansion planning, non competitive procurement, confidentiality of PPAs)
- PPAs mostly rigid and inflexible to secure margins even if not dispatched
- Potential contingent liabilities for the host country (sovereign guarantees and when excess capacity is contracted)
- Inability to balance risks between developers and single buyer - often concentrated risk in single buyer agent

Source: Arizu, Gencer & Maurer, “Centralized Purchasing Arrangements: International Practices and Lessons Learned on Variations to the Single Buyer Model”, World Bank, 2006



# Single buyer – functions



In the Single Buyer model central agents are involved in more than energy trading activities including:

**Transmission planning** – Expansion and upgrades

**Provider of transmission services** – Access to the grid, transmission charges, international interconnections

**Investment planning** – Forecasting demand, contracting for new supply, evaluating least cost expansion

**Power system operator** – Scheduling and dispatch, coordination of maintenance of transmission and generation, procurement of ancillary services, balancing power system

**Market operator** – Administration of spot market or balancing mechanism

Single Buyer /  
central agent



# Single buyer – key success factors



Single Buyer - measures used to mitigate problems found

- Do not give purchasing agent a monopoly status - consider allowing bilateral arrangements between generators and distributors
- Organizational structure and key procurement processes should be as transparent and competitive as possible
- The purchasing agent should not take ownership for the energy traded, and instead act like a broker, when market conditions permit
- Consider allowing the Single Buyer model to evolve to other more complex models by unbundling roles and responsibilities of central agent to a reasonable extent in order to enable some checks and balances
- More flexible contractual arrangements should be used to encourage IPPs to take additional risks associated with the power market
- There should be a game plan to allow power sector reform to evolve
- Sovereign guarantees should be granted on a selective basis

Source: Adapted by Tt from “Centralized Purchasing Arrangements: International Practices and Lessons Learned on Variations to the Single Buyer Model”, World Bank, 2006





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# *Why reform – Key questions*



Why would a government be reforming its power sector?

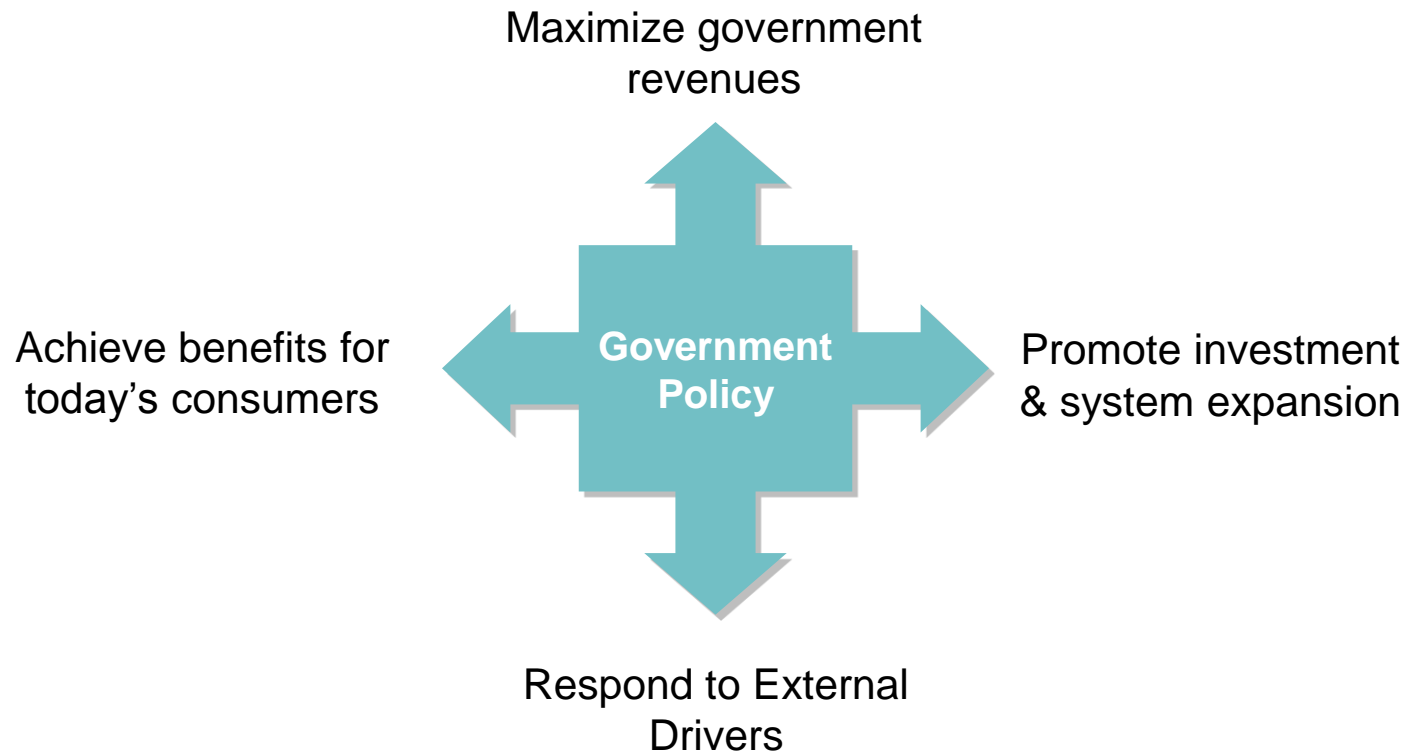
- High public sector debt?
- Bankrupt electricity companies?
- To promote private sector investment?
- To achieve lower electricity prices for customers?
- To improve service to electricity customers?
- To achieve greater fuel efficiency?
- To achieve higher asset utilization?
- To reduce subsidies?



# *Clear defined choices – country goals*



We can group these questions together into four types of Governments policy goals:





# Clear defined choices – country goals



## Maximize Government Revenues

- Favor vertically integrated monopolies over competitive markets
- Electricity supply industry organization designed to maximize scale economies, and hence profitability
- Higher degrees of certainty for investors, often in the form of contractual guarantees, explicit regulatory formula and approaches, and other risk mitigating measures
- Predictable tariff trajectory, indicating higher profit opportunities for companies

## Achieve Benefits for Today's Consumers

- Favor unbundled systems & competitive markets to drive tariffs lower
- Strong, consumer-oriented regulator, seeking to improve reliability of supply
- Allowing “customer choice” of supplier, or of type of power (firm, interruptible, time-of-use)
- Rapid pass-through of electricity supply industry efficiency gains in the form of lower prices

## Promote Investment & System Expansion

- Favor vertically integrated monopolies over competitive markets
- Set up distribution service territories and mandatory obligations to serve
- Maintenance or imposition of direct subsidies - urban & rural
- Promote new investment in generation, through IPPs and distributed generation system

## Respond to External Drivers

- Favor unbundled systems & competitive markets
- Requirements imposed by multilateral lenders or finance agencies (e.g., World Bank, IMF) regarding privatization, or market structure
- Opportunity to export, or import from other countries
- Learn about needs of global IPP companies, and cater to them
- Introduce foreign managerial or technical expertise, to foster transfer of skills to your country

Decisions must be taken based on trade-offs



# *Clear defined choices – articulate priority*



What power sector structure will best allow government to succeed?:

- First, government should clearly articulate its priority among these conflicting objectives
- If system expansion (or service improvement) is the primary goal, then investment is required. With good communication, customers can come to understand why electricity tariffs are going up
- But in fully-developed country, where everyone is already served with electricity, then driving electricity prices down for existing consumers would be a priority. If so, a competitive market model would seem likely



# Discussion